

WHAT IS CLAIMED IS:

1. An adsorbent for selective removal of sulfur from a hydrocarbon feedstock, comprising:

a matrix material having a surface area of at least about 400 m²/g and a surface acidity of less than about 0.20 $\mu\text{mol}/\text{m}^2$; and

a metal phase dispersed through said matrix, said metal phase being selective to reversible adsorption of sulfur.

2. The adsorbent of claim 1, wherein said matrix material has surface acidity of less than about 0.05 $\mu\text{mol}/\text{m}^2$.

3. The adsorbent of claim 1, wherein said matrix material has a surface area of between 400 m²/g and about 1200 m²/g.

4. The adsorbent of claim 1, wherein said matrix material has a surface area of between about 600 m²/g and about 1000 m²/g.

5. The adsorbent of claim 1, wherein said metal phase is present at a surface atomic concentration ratio of between about 80 and about 500.

6. The adsorbent of claim 1, wherein said matrix is selected from the group consisting of siliceous oxides, alumina, molecular sieves, structurally ordered materials and combinations thereof.

7. The adsorbent of claim 1, wherein said matrix is siliceous oxide.

8. The adsorbent of claim 1, further comprising a binder disposed through said matrix.

9. The adsorbent of claim 1, wherein said metal phase comprises a metal having one of a d5 and d10 electron configuration.

10. The adsorbent of claim 1, wherein said metal phase is selected from Group IB, IIB, VII B and VIII of the periodic table of elements, and combinations thereof.

11. The adsorbent of claim 1, wherein said metal phase is a Group VIII metal.

12. The adsorbent of claim 1, wherein said metal phase is present at a surface of said matrix material as particles having a particle size of less than or equal to about 10nm.

13. A process for removing sulfur compounds from a liquid hydrocarbon, comprising the steps of:

providing a hydrocarbon feedstock containing sulfur;

providing an adsorbent comprising a matrix material having a surface area of at least about 400 m²/g and a surface acidity of less than about 0.20 μmol/m², and a metal phase dispersed through said matrix, said metal phase being selective to reversible adsorption of sulfur; and

exposing said feedstock to said adsorbent under sulfur adsorption conditions whereby sulfur from said feedstock is adsorbed by said adsorbent.

14. The process of claim 13, wherein said sulfur adsorption conditions include a temperature of less than or equal to about 300°C and a pressure of less than or equal to about 500 psi.

15. The process of claim 13, wherein said feedstock is selected from the group consisting of FCC cracked naphtha, Diesel and combination thereof.

16. The process of claim 13, wherein said feedstock has a diene content of at least about 1.4% by volume.

17. The process of claim 13, wherein said feedstock contains sulfur in an amount less than or equal to about 1000 ppm.

18. The process of claim 13, wherein said step of providing said adsorbent comprises drying said adsorbent at a temperature of between about 80°C and about 250°C to provide a dried adsorbent, and calcining said dried adsorbent at a temperature of between about 400°C and about 700°C.

19. The process of claim 13, wherein said feedstock contains organic sulfur compounds, and wherein said organic sulfur compounds are adsorbed by said adsorbent.

20. The process of claim 13, wherein said exposing step results in an adsorbent having adsorbed sulfur, and further comprising flushing said adsorbent with a desorbent whereby said adsorbed sulfur is removed from said adsorbent.

21. The process of claim 20, wherein said flushing

step is carried out at a temperature of less than or equal to about 300°C and a pressure of less than or equal to about 300 psig.

22. The process of claim 20, wherein said desorbent is selected from the group consisting of $C_1 - C_{16}$ olefin-free hydrocarbons.

23. The process of claim 22, wherein said desorbent is selected from the group consisting of paraffins, aromatics alcohols, ethers, ketones and mixtures thereof.

24. The process of claim 22, wherein said desorbent is a $C_1 - C_{10}$ paraffinic hydrocarbon.

25. The process of claim 20, further comprising purging said adsorbent with a purging stream prior to said flushing step whereby non-adsorbed feedstock is removed from said adsorbent.

26. The process of claim 25, wherein said purging stream is inert with respect to said adsorbent.

27. The process of claim 25, wherein said purging stream is selected from the group consisting of nitrogen,

air, methane, ethane, propane and combinations thereof.

28. A method for preparing an adsorbent for selective removal of sulfur from a hydrocarbon stream, comprising the steps of:

providing a matrix material;

forming said matrix material to form shaped adsorbent elements; and

contacting said elements with a transition metal solution so as to disperse said metal through said matrix and provide said adsorbent.

29. The method of claim 28, wherein said adsorbent has a surface area of at least about 400 m²/g and a surface acidity or less than about 0.20 $\mu\text{mol}/\text{m}^2$.